CPC COOPERATIVE PATENT CLASSIFICATION

F05D INDEXING SCHEME FOR ASPECTS RELATING TO NON-POSITIVE-DISPLACEMENT MACHINES OR ENGINES, GAS-TURBINES OR JET-PROPULSION PLANTS

F05D 2200/00 Mathematical features

F05D 2200/10 . Basic functions
F05D 2200/11 . . Sum
F05D 2200/12 . . Subtraction
F05D 2200/13 . . Product
F05D 2200/14 . . Division
F05D 2200/15 . . Inverse

F05D 2200/20 . Special functions
F05D 2200/21 . . Root
F05D 2200/211 . . . Square root
F05D 2200/212 . . . Cubic root
F05D 2200/22 . . Power
F05D 2200/221 . . . Square power
F05D 2200/222 . . . Cubic power
F05D 2200/23 . . Logarithm
F05D 2200/24 . . exponential
F05D 2200/25 . . Hyperbolic trigonometric, e.g. sinh, cosh, tanh
F05D 2200/26 . . trigonometric
F05D 2200/261 . . . Sine
F05D 2200/262 . . . Cosine
F05D 2200/263 . . . Tangent
F05D 2200/264 . . . Cotangent

F05D 2200/30 . miscellaneous
F05D 2200/31 . . odd
F05D 2200/32 . . even
F05D 2200/33 . . bigger or smaller
F05D 2200/34 . . biggest or smallest
F05D 2200/35 . . first
F05D 2200/36 . . last

F05D 2210/00 **Working fluids**

F05D 2210/10 . Kind or type
F05D 2210/11 . . liquid, i.e. incompressible
F05D 2210/12 . . gaseous, i.e. compressible
F05D 2210/13 . . mixed, e.g. two-phase fluid
F05D 2210/132 . . . Pumps with means for separating and evacuating the gaseous phase
F05D 2210/14 . . Refrigerants with particular properties, e.g. HFC

F05D 2210/20 . Properties

F05D 2210/30 . Flow characteristics
F05D 2210/31 . . with Mach-number kept constant along the flow
F05D 2210/32 . . Pressure kept constant along the flow
F05D 2210/33 . . Turbulent flow
F05D 2210/34 . . Laminar flow

F05D 2210/40 . Flow geometry or direction
F05D 2210/41 . . upwards due to the buoyancy of compressed air
F05D 2210/42 . . Axial inlet and radial outlet
F05D 2210/43 . . Radial inlet and axial outlet
F05D 2210/44 . . bidirectional, i.e. in opposite, alternating directions

F05D 2220/00 **Application**

F05D 2220/10 . in ram-jet engines or ram-jet driven vehicles

F05D 2220/20 . within closed fluid conduits, e.g. pipes

F05D 2220/30 . in turbines
F05D 2220/31 . . in steam turbines
F05D 2220/32 . . in gas turbines
F05D 2220/321 . . . for a special turbine stage
F05D 2220/3212 . . . . the first stage of a turbine
F05D 2220/3213 . . . . an intermediate stage of the turbine
F05D 2220/3215 . . . . the last stage of the turbine
F05D 2220/3216 . . . . for a special compressor stage
F05D 2220/3217 . . . . . for the first stage of a compressor or a low pressure compressor
F05D 2220/3218 . . . . . for an intermediate stage of a compressor
F05D 2220/3219 . . . . . for the last stage of a compressor or a high pressure compressor
F05D 2220/323 . . . for aircraft propulsion, e.g. jet engines
F05D 2220/324 . . . to drive unshrouded, low solidity propeller
F05D 2220/325 . . . to drive unshrouded, high solidity propeller

F05D 2220/326 . . . to drive shrouded, low solidity propeller
F05D 2220/327 . . . to drive shrouded, high solidity propeller
F05D 2220/328 . . . providing direct vertical lift
F05D 2220/329 . . . in helicopters
F05D 2220/34 . . in ram-air turbines ("RATS")
F05D 2220/36 . . specially adapted for the fan of turbofan engines

F05D 2220/40 . in turbochargers

F05D 2220/50 . for auxiliary power units (APU's)

F05D 2220/60 . making use of surplus or waste energy
F05D 2220/62 . . with energy recovery turbines
F05D 2220/64 . . for domestic central heating or production of electricity

F05D 2220/70 . in combination with
F05D 2220/72 . . a steam turbine
F05D 2220/722 . . . as part of an integrated gasification combined cycle
F05D 2220/74 . . a gas turbine
F05D 2220/75 . . equipment using fuel having a low calorific value, e.g. low BTU fuel, waste end, syngas, biomass fuel or flare gas
F05D 2220/76 . . an electrical generator
F05D 2220/762 . . . of the direct current (D.C.) type
F05D 2220/764 . . . of the alternating current (A.C.) type
F05D 2220/7642 . . . . of the synchronous type
F05D 2220/7644 . . . . of the asynchronous type, i.e. induction type
F05D 2220/7646 . . . . . Double fed induction generators (DFIGs)
F05D 2220/766 . . . via a direct connection, i.e. a gearless transmission
F05D 2220/768 . . . equipped with permanent magnets
F05D 2220/77 . . . of the linear type

F05D 2220/80 . in supersonic vehicles excluding hypersonic vehicles or ram, scram or rocket propulsion

F05D 2220/90 . in vehicles adapted for vertical or short take off and landing (v/stol vehicles), (gas turbines providing direct vertical lift **R05D 220/38**)

F05D 2230/00 Manufacture

F05D 2230/10 . by removing material
F05D 2230/11 . . by electrochemical methods
F05D 2230/12 . . by spark erosion methods
F05D 2230/13 . . using lasers
F05D 2230/14 . . Micromachining
F05D 2230/18 . . Manufacturing tolerances

F05D 2230/20 . essentially without removing material
F05D 2230/21 .. by casting
F05D 2230/211 ... by precision casting, e.g. microfusing or investment casting
F05D 2230/22 .. by sintering
F05D 2230/23 .. by permanently joining parts together
F05D 2230/232 ... by welding
F05D 2230/233 .... Electron beam welding
F05D 2230/234 .... Laser welding
F05D 2230/235 .... TIG or MIG welding
F05D 2230/236 .... Diffusion bonding
F05D 2230/237 .... Brazing
F05D 2230/238 .... Soldering
F05D 2230/239 .... Inertia or friction welding
F05D 2230/24 .. by extrusion
F05D 2230/25 .. by forging
F05D 2230/26 .. by rolling

F05D 2230/30 . with deposition of material
F05D 2230/31 .. Layer deposition
F05D 2230/311 ... by torch or flame spraying
F05D 2230/312 ... by plasma spraying
F05D 2230/313 ... by physical vapour deposition
F05D 2230/314 ... by chemical vapour deposition

F05D 2230/40 . Heat treatment
F05D 2230/41 .. Hardening; Annealing
F05D 2230/411 ... Precipitation hardening
F05D 2230/42 .. by hot isostatic pressing

F05D 2230/50 . Building or constructing in particular ways
F05D 2230/51 .. in a modular way, e.g. using several identical or complementary parts or features
F05D 2230/52 .. using existing or "off the shelf" parts, e.g. using standardized turbocharger elements
F05D 2230/53 .. by integrally manufacturing a component, e.g. by milling from a billet or one piece construction
F05D 2230/54 .. by sheet metal manufacturing

F05D 2230/60 . Assembly methods
F05D 2230/61 .. using limited numbers of standard modules which can be adapted by machining
F05D 2230/64 .. using positioning or alignment devices for aligning or centring, e.g. pins
F05D 2230/642 ... using maintaining alignment while permitting differential dilatation
F05D 2230/644 ... for adjusting the position or the alignment, e.g. wedges or eccenters
F05D 2230/68 .. using auxiliary equipment for lifting or holding

F05D 2230/70 . Disassembly methods

F05D 2230/72 . Maintenance

F05D 2230/80 . Repairing, retrofitting or upgrading methods

F05D 2230/90 . Coating; Surface treatment (manufacture with deposition of material F05D 2230/30)

F05D 2240/00 Components

NOTE

Components are the basic elements of construction

F05D 2240/10 . Stators
F05D 2240/11 .. Shroud seal segments
F05D 2240/12 .. Fluid guiding means, e.g. vanes
F05D 2240/121 ... related to the leading edge of a stator vane
F05D 2240/122 ... related to the trailing edge of a stator vane
F05D 2240/123 ... related to the pressure side of a stator vane
F05D 2240/124 ... related to the suction side of a stator vane
F05D 2240/125 ... related to the tip of a stator vane
F05D 2240/126 ... Baffles or ribs
F05D 2240/127 ... Vortex generators, turbulators, or the like, for mixing (by creating turbulence F05D 2260/2212)
F05D 2240/128 ... Nozzles
F05D 2240/1281 .... Plug nozzles
F05D 2240/129 ... Cascades, i.e. assemblies of similar profiles acting in parallel
F05D 2240/14 .. Casings or housings protecting or supporting assemblies within
F05D 2240/15 .. Heat shield

F05D 2240/20 . Rotors
F05D 2240/24 .. for turbines
F05D 2240/241 ... of impulse type
F05D 2240/242 ... of reaction type
F05D 2240/243 ... of the Archimedes screw type
F05D 2240/30 .. Characteristics of rotor blades, i.e. of any element transforming dynamic fluid energy to or from rotational energy and being attached to a rotor
F05D 2240/301 ... Cross-sectional characteristics
F05D 2240/302 ... characteristics related to shock waves, transonic or supersonic flow
F05D 2240/303 ... related to the leading edge of a rotor blade
F05D 2240/304 ... related to the trailing edge of a rotor blade
F05D 2240/305 ... related to the pressure side of a rotor blade
F05D 2240/306 ... related to the suction side of a rotor blade

F05D 2240/307 . . . related to the tip of a rotor blade
F05D 2240/31 . . . with roughened surfaces

F05D 2240/35 . Combustors or associated equipment
F05D 2240/36 . . Fuel vaporizer

F05D 2240/40 . Use of a multiplicity of similar components

F05D 2240/50 . Bearings
F05D 2240/51 . . Magnetic
F05D 2240/511 . . . with permanent magnets
F05D 2240/515 . . . Electromagnetic
F05D 2240/52 . . Axial thrust bearings
F05D 2240/53 . . Hydrodynamic or hydrostatic bearings
F05D 2240/54 . . Radial bearings

F05D 2240/55 . Seals
F05D 2240/56 . . Brush seals
F05D 2240/57 . . Leaf seals
F05D 2240/58 . . Piston ring seals
F05D 2240/581 . . . Double or plural piston ring arrangements, i.e. two or more piston rings
F05D 2240/59 . . Lamellar seals

F05D 2240/60 . Shafts
F05D 2240/61 . . Hollow
F05D 2240/62 . . Flexible
F05D 2240/63 . . Glands for admission or removal of fluids from shafts

F05D 2240/70 . Slinger plates or washers

F05D 2240/80 . Platforms for stationary or moving blades
F05D 2240/81 . . Cooled platforms

F05D 2240/90 . Mounting on supporting structures or systems
F05D 2240/91 . . on a stationary structure

F05D 2250/00 Geometry

NOTE

Geometry indicates the shape or form of a component or the configuration or arrangement of components in a machine or in a plant

F05D 2250/10 . Two-dimensional
F05D 2250/11 . . triangular
F05D 2250/12 . . rectangular

F05D 2250/121 . . . square
F05D 2250/13 . . trapezoidal
F05D 2250/131 . . . polygonal
F05D 2250/132 . . . hexagonal
F05D 2250/14 . . elliptical
F05D 2250/141 . . . circular
F05D 2250/15 . . spiral
F05D 2250/16 . . parabolic
F05D 2250/17 . . hyperbolic
F05D 2250/18 . . patterned
F05D 2250/181 . . . ridged
F05D 2250/182 . . . crenellated, notched
F05D 2250/183 . . . zigzag
F05D 2250/184 . . . sinusoidal
F05D 2250/185 . . . serpentine-like
F05D 2250/19 . . machined; miscellaneous
F05D 2250/191 . . . perforated
F05D 2250/192 . . . bevelled
F05D 2250/193 . . . milled

F05D 2250/20 . Three-dimensional
F05D 2250/21 . . pyramidal
F05D 2250/22 . . parallelepipedal
F05D 2250/221 . . . cubic
F05D 2250/23 . . prismatic
F05D 2250/231 . . . cylindrical
F05D 2250/232 . . . conical
F05D 2250/24 . . ellipsoidal
F05D 2250/241 . . . spherical
F05D 2250/25 . . helical
F05D 2250/26 . . paraboloid
F05D 2250/27 . . hyperboloid
F05D 2250/28 . . patterned
F05D 2250/281 . . . threaded
F05D 2250/282 . . . cubic pattern
F05D 2250/283 . . . honeycomb
F05D 2250/29 . . machined; miscellaneous
F05D 2250/291 . . . hollowed
F05D 2250/292 . . . tapered
F05D 2250/293 . . . lathed, e.g. rotation symmetrical
F05D 2250/294 . . . grooved

F05D 2250/30 . Arrangement of components
F05D 2250/31 . . according to the direction of their main axis or their axis of rotation
F05D 2250/311 . . . the axes being in line
F05D 2250/312 . . . the axes being parallel to each other
F05D 2250/313 . . . the axes being perpendicular to each other
F05D 2250/314 . . . the axes being inclined in relation to each other
F05D 2250/315 . . . the main axis being substantially vertical
F05D 2250/32 . . according to their shape
F05D 2250/321 . . . asymptotic
F05D 2250/322 . . . tangential
F05D 2250/323 . . . convergent
F05D 2250/324 . . . divergent
F05D 2250/33 . . symmetrical
F05D 2250/34 . . translated
F05D 2250/35 . . rotated
F05D 2250/36 . . in inner-outer relationship, e.g. shaft-bearing arrangements
F05D 2250/37 . . circumferential
F05D 2250/38 . . angled, e.g. sweep angle

F05D 2250/40 . Movement of components
F05D 2250/41 . . with one degree of freedom
F05D 2250/411 . . . in rotation
F05D 2250/42 . . with two degrees of freedom
F05D 2250/43 . . with three degrees of freedom
F05D 2250/44 . . by counter rotation

F05D 2250/50 . Inlet or outlet
F05D 2250/51 . . Inlet
F05D 2250/511 . . . augmenting, i.e. with intercepting fluid flow cross sectional area greater than the rest of the machine behind the inlet
F05D 2250/512 . . . concentrating only, i.e. with intercepting fluid flow cross sectional area not greater than the rest of the machine behind the inlet
F05D 2250/52 . . Outlet
F05D 2250/53 . . of regenerative pumps

F05D 2250/60 . Structure; Surface texture
F05D 2250/61 . . corrugated
F05D 2250/611 . . . undulated
F05D 2250/62 . . smooth or fine
F05D 2250/621 . . . polished
F05D 2250/63 . . coarse

F05D 2250/70 . Shape

F05D 2250/71 . . curved
F05D 2250/711 . . . convex
F05D 2250/712 . . . concave
F05D 2250/713 . . . inflexed
F05D 2250/72 . . symmetric
F05D 2250/73 . . asymmetric
F05D 2250/74 . . given by a set or table of xyz-coordinates
F05D 2250/75 . . given by its similarity to a letter, e.g. T-shaped

F05D 2250/80 . Size or power range of the machines
F05D 2250/82 . . Micromachines
F05D 2250/84 . . Nanomachines (Nanotechnology for interacting, sensing or actuating **Y01N 8/00**)

F05D 2250/90 . Variable geometry

F05D 2260/00 Function

F05D 2260/02 . Transport and handling during maintenance and repair

F05D 2260/10 . Particular cycles

F05D 2260/12 . Testing on a test bench

F05D 2260/14 . Preswirling

F05D 2260/15 . Load balancing

F05D 2260/16 . Fluid modulation at a certain frequency

F05D 2260/20 . Heat transfer, e.g. cooling
F05D 2260/201 . . by impingement of a fluid
F05D 2260/202 . . by film cooling
F05D 2260/203 . . by transpiration cooling
F05D 2260/204 . . by the use of microcircuits
F05D 2260/205 . . Cooling fluid recirculation, i.e. after cooling one or more components is the cooling fluid recovered and used elsewhere for other purposes
F05D 2260/207 . . using a phase changing mass, e.g. heat absorbing by melting or boiling
F05D 2260/208 . . using heat pipes
F05D 2260/209 . . using vortex tubes
F05D 2260/211 . . by intercooling, e.g. during a compression cycle
F05D 2260/212 . . by water injection
F05D 2260/213 . . by the provision of a heat exchanger within the cooling circuit
F05D 2260/221 . . Improvement of heat transfer
F05D 2260/2212 . . . by creating turbulence (vortex generators, turbulators or the like for mixing F05D 2240/127)
F05D 2260/2214 . . . by increasing the heat transfer surface

F05D 2260/22141 .... using fins or ribs
F05D 2260/231 .. Preventing heat transfer
F05D 2260/232 .. characterized by the cooling medium
F05D 2260/2322 ... steam
F05D 2260/234 .. of the generator by compressor inlet air
F05D 2260/24 .. for draft enhancement in chimneys, using solar or other heat sources

F05D 2260/30 . Retaining components in desired mutual position

F05D 2260/31 . Retaining bolts or nuts

F05D 2260/311 . of the frangible or shear type
F05D 2260/32 .. by means of magnetic or electromagnetic forces
F05D 2260/33 .. with a bayonet coupling
F05D 2260/34 .. Balancing of radial or axial forces on regenerative rotors
F05D 2260/35 .. Reducing friction between regenerative impeller discs and casing walls
F05D 2260/36 .. by a form fit connection, e.g. by interlocking
F05D 2260/37 .. by a press fit connection
F05D 2260/38 .. by a spring, i.e. spring loaded or biased towards a certain position
F05D 2260/39 .. by a V-shaped ring to join the flanges of two cylindrical sections, e.g. casing sections of a turbocharger

F05D 2260/40 . Transmission of power
F05D 2260/402 .. through friction drives
F05D 2260/4021 ... through belt drives
F05D 2260/4022 ... through endless chains
F05D 2260/4023 ... through a friction clutch
F05D 2260/403 .. through the shape of the drive components
F05D 2260/4031 ... as in toothed gearing
F05D 2260/40311 .... of the epicyclical, planetary or differential type
F05D 2260/404 .. through magnetic drive coupling
F05D 2260/4041 ... the driven magnets encircling the driver magnets
F05D 2260/406 .. through hydraulic systems
F05D 2260/407 .. through piezoelectric conversion
F05D 2260/408 .. through magnetohydrodynamic conversion

F05D 2260/42 . Storage of energy
F05D 2260/43 .. in the form of rotational kinetic energy, e.g. in flywheels

F05D 2260/50 . Kinematic linkage, i.e. transmission of position
F05D 2260/52 .. involving springs
F05D 2260/53 .. using gears
F05D 2260/532 ... of the bevelled or angled type
F05D 2260/54 .. using flat or V-belts and pulleys

F05D 2260/55 . . using chains and sprockets; using toothed belts
F05D 2260/56 . . using cams or eccentrics
F05D 2260/57 . . using servos, independent actuators, etc.

F05D 2260/60 . Fluid transfer
F05D 2260/601 . . using an ejector or a jet pump
F05D 2260/602 . . Drainage
F05D 2260/6022 . . . of leakage having past a seal (seals F05D 2240/57; glands F05D 2240/63)
F05D 2260/604 . . Vortex non-clogging type pumps
F05D 2260/605 . . Venting into the ambient atmosphere or the like
F05D 2260/606 . . Bypassing the fluid
F05D 2260/607 . . Preventing clogging or obstruction of flow paths by dirt, dust, or foreign particles
F05D 2260/608 . . Aeration, ventilation, dehumidification or moisture removal of closed spaces
F05D 2260/609 . . Deoiling or demisting
F05D 2260/61 . . Removal of CO2 (removal of CO2 from waste gases B01D 53/62)
F05D 2260/611 . . Sequestration of CO2

F05D 2260/70 . Adjusting of angle of incidence or attack of rotating blades
F05D 2260/71 . . as a function of flow velocity
F05D 2260/72 . . by turning around an axis parallel to the rotor centre line
F05D 2260/74 . . by turning around an axis perpendicular the rotor centre line
F05D 2260/75 . . the adjusting mechanism not using auxiliary power sources, e.g. by "servos"
F05D 2260/76 . . the adjusting mechanism using auxiliary power sources
F05D 2260/77 . . the adjusting mechanism driven or triggered by centrifugal forces
F05D 2260/78 . . the adjusting mechanism driven or triggered by aerodynamic forces
F05D 2260/79 . . Bearing, support or actuation arrangements therefor

F05D 2260/80 . Diagnostics

F05D 2260/81 . Modelling or simulation

F05D 2260/82 . Forecasts
F05D 2260/821 . . Parameter estimation or prediction

F05D 2260/83 . Testing, e.g. methods, components or tools therefor

F05D 2260/84 . Redundancy

F05D 2260/85 . Starting

F05D 2260/90 . Braking
F05D 2260/901 . . using aerodynamic forces, i.e. lift or drag
F05D 2260/902 . . using frictional mechanical forces
F05D 2260/903 . . using electrical or magnetic forces
F05D 2260/904 . . using hydrodynamic forces

F05D 2260/94 . Functionality given by mechanical stress related aspects such as low cycle fatigue (LCF) of high cycle fatigue (HCF)

F05D 2260/941 . . particularly aimed at mechanical or thermal stress reduction

F05D 2260/95 . Preventing corrosion (coating or surface treatment F05D 2230/90)

F05D 2260/96 . Preventing, counteracting or reducing vibration or noise

F05D 2260/961 . . by mistuning rotor blades or stator vanes with irregular interblade spacing, airfoil shape

F05D 2260/962 . . by means of "anti-noise"

F05D 2260/963 . . by Helmholtz resonators

F05D 2260/964 . . counteracting thermoacoustic noise

F05D 2260/97 . Reducing windage losses

F05D 2260/972 . . in radial flow machines

F05D 2260/98 . Lubrication

F05D 2260/99 . Ignition, e.g. ignition by warming up of fuel or oxidizer in a resonant acoustic cavity

F05D 2270/00 Control

F05D 2270/01 . Purpose of the control system

F05D 2270/02 . . to control rotational speed (n)

F05D 2270/021 . . . to prevent overspeed

F05D 2270/022 . . . to prevent underspeed

F05D 2270/023 . . . of different spools or shafts

F05D 2270/024 . . . to keep rotational speed constant

F05D 2270/03 . . in variable speed operation

F05D 2270/04 . . to control acceleration (u)

F05D 2270/042 . . . by keeping it below damagingly high values

F05D 2270/044 . . . by making it as high as possible

F05D 2270/05 . . to affect the output of the engine

F05D 2270/051 . . . Thrust

F05D 2270/052 . . . Torque

F05D 2270/053 . . . Explicitly mentioned power

F05D 2270/06 . . to match engine to driven device

F05D 2270/061 . . . in particular the electrical frequency of driven generator

F05D 2270/07 . . to improve fuel economy

F05D 2270/071 . . . in particular at idling speed

F05D 2270/08 . . to produce clean exhaust gases

F05D 2270/081 . . . with as little smoke as possible

F05D 2270/082 . . . with as little NOx as possible

F05D 2270/083 . . . by monitoring combustion conditions

F05D 2270/0831 .... indirectly, at the exhaust
F05D 2270/09 .. to cope with emergencies
F05D 2270/091 ... in particular sudden load loss
F05D 2270/092 ... in particular blow-out and relight
F05D 2270/093 ... of one engine in a multi-engine system
F05D 2270/094 ... by using back-up controls
F05D 2270/095 ... by temporary overriding set control limits
F05D 2270/096 ... caused by water or hail ingestion
F05D 2270/10 .. to cope with, or avoid, compressor flow instabilities
F05D 2270/101 ... Compressor surge or stall
F05D 2270/102 .... caused by working fluid flow velocity profile distortion
F05D 2270/1022 ..... due to high angle of attack of aircraft
F05D 2270/1024 ..... due to compressor degradation
F05D 2270/11 .. to prolong engine life
F05D 2270/112 ... by limiting temperatures
F05D 2270/114 ... by limiting mechanical stresses
F05D 2270/116 ... by preventing reverse rotation
F05D 2270/12 .. to maintain desired vehicle trajectory parameters
F05D 2270/121 ... Altitude
F05D 2270/122 ... Speed or Mach number
F05D 2270/13 .. to control two or more engines simultaneously
F05D 2270/14 .. to control thermoacoustic behaviour in the combustion chambers (counteracting noise or vibration **F05D 260/96**)
F05D 2270/16 .. to control water or steam injection
F05D 2270/17 .. to control boundary layer
F05D 2270/172 ... by a plasma generator, e.g. control of ignition
F05D 2270/173 ... by the Coanda effect
F05D 2270/18 .. using fluidic amplifiers or actuators
F05D 2270/20 .. to optimize the performance of a machine

F05D 2270/30 . Control parameters, e.g. input parameters
F05D 2270/301 .. Pressure
F05D 2270/3011 ... Inlet pressure
F05D 2270/3013 ... Outlet pressure
F05D 2270/3015 ... differential pressure
F05D 2270/303 .. Temperature
F05D 2270/3032 ... excessive temperatures, e.g. caused by overheating
F05D 2270/304 .. Spool rotational speed
F05D 2270/305 .. Tolerances
F05D 2270/306 .. Mass flow
F05D 2270/3061 ... of the working fluid
F05D 2270/3062 ... of the auxiliary fluid for heating or cooling purposes

F05D 2270/309 . . Rate of change of parameters
F05D 2270/31 . . Fuel schedule for stage combustors
F05D 2270/311 . . Air humidity
F05D 2270/312 . . Air pressure
F05D 2270/313 . . Air temperature
F05D 2270/331 . . Mechanical loads
F05D 2270/332 . . Maximum loads or fatigue criteria
F05D 2270/333 . . Noise or sound levels
F05D 2270/334 . . Vibration measurements
F05D 2270/335 . . Output power or torque
F05D 2270/336 . . Blade lift measurements

F05D 2270/40 . Type of control system
F05D 2270/42 . . passive or reactive, e.g. using large wind vanes
F05D 2270/44 . . active, predictive, or anticipative
F05D 2270/46 . . redundant, i.e. failsafe operation

F05D 2270/50 . Control logic embodiments
F05D 2270/52 . . by electrical means, e.g. relays or switches
F05D 2270/54 . . by electronic means, e.g. electronic tubes, transistors or IC`s within an electronic circuit
F05D 2270/56 . . by hydraulic means, e.g. hydraulic valves within a hydraulic circuit
F05D 2270/58 . . by mechanical means, e.g. levers, gears or cams

F05D 2270/60 . Control system actuates means
F05D 2270/62 . . Electrical actuators
F05D 2270/64 . . Hydraulic actuators
F05D 2270/65 . . Pneumatic actuators
F05D 2270/66 . . Mechanical actuators (F05D 2270/62 takes precedence)

F05D 2270/70 . Type of control algorithm
F05D 2270/701 . . proportional
F05D 2270/702 . . differential
F05D 2270/703 . . integral
F05D 2270/704 . . proportional-differential
F05D 2270/705 . . proportional-integral
F05D 2270/706 . . proportional-integral-differential
F05D 2270/707 . . fuzzy logic
F05D 2270/708 . . with comparison tables
F05D 2270/709 . . with neural networks
F05D 2270/71 . . synthesized, i.e. parameter computed by a mathematical model

F05D 2270/80 . Devices generating input signals, e.g. transducers, sensors, cameras or strain gauges
F05D 2270/802 . . Calibration thereof

F05D 2270/803 . . Sampling thereof
F05D 2270/804 . . Optical devices
F05D 2270/8041 . . . Cameras
F05D 2270/805 . . Radars
F05D 2270/806 . . Sonars
F05D 2270/807 . . Accelerometers
F05D 2270/808 . . Strain gauges; Load cells
F05D 2270/809 . . Encoders
F05D 2270/81 . . Microphones
F05D 2270/821 . . Displacement measuring means, e.g. inductive

F05D 2280/00

F05D 2290/00

F05D 2300/00 **Materials; Properties thereof**

F05D 2300/10 . Metals, alloys or intermetallic compounds
F05D 2300/11 . . Iron
F05D 2300/111 . . . Cast iron
F05D 2300/12 . . Light metals
F05D 2300/121 . . . Aluminium
F05D 2300/122 . . . Beryllium
F05D 2300/123 . . . Boron
F05D 2300/124 . . . Lithium
F05D 2300/125 . . . Magnesium
F05D 2300/13 . . Refractory metals, i.e. Ti, V, Cr, Zr, Nb, Mo, Hf, Ta, W
F05D 2300/131 . . . Molybdenum
F05D 2300/132 . . . Chromium
F05D 2300/133 . . . Titanium
F05D 2300/134 . . . Zirconium
F05D 2300/135 . . . Hafnium
F05D 2300/14 . . Noble metals, i.e. Ag, Au, platinum group metals
F05D 2300/141 . . . Silver
F05D 2300/142 . . . Gold
F05D 2300/143 . . . Platinum group metals, i.e. Os, Ir, Pt, Ru, Rh, Pd
F05D 2300/1431 . . . . Palladium
F05D 2300/1432 . . . . Ruthenium
F05D 2300/1433 . . . . Osmium
F05D 2300/1434 . . . . Iridium
F05D 2300/1435 . . . . Rhodium

F05D 2300/15 .. Rare earth metals, i.e. Sc, Y, lanthanides
F05D 2300/16 .. Other metals not provided for in groups F05D 2300/11 to F05D 2300/15
F05D 2300/1602 ... Arsenic
F05D 2300/1604 ... Antimony
F05D 2300/1606 ... Bismuth
F05D 2300/1608 ... Barium
F05D 2300/161 ... Manganese
F05D 2300/1612 ... Lead
F05D 2300/1614 ... Tin
F05D 2300/1616 ... Zinc
F05D 2300/1618 ... Mercury
F05D 2300/17 .. Alloys
F05D 2300/171 ... Steel alloys
F05D 2300/172 ... Copper alloys
F05D 2300/1721 .... Bronze
F05D 2300/1722 .... Phosphor-bronze alloy
F05D 2300/1723 .... Nickel-Copper alloy, e.g. Monel
F05D 2300/173 ... Aluminium alloys, e.g. AlCuMgPb
F05D 2300/174 ... Titanium alloys, e.g. TiAl
F05D 2300/175 ... Superalloys
F05D 2300/176 ... Heat-stable alloys
F05D 2300/177 ... Ni - Si alloys
F05D 2300/18 .. Intermetallic compounds
F05D 2300/182 ... Metal-aluminide intermetallic compounds

F05D 2300/20 . Oxide or non-oxide ceramics
F05D 2300/21 .. Oxide ceramics
F05D 2300/2102 ... Glass
F05D 2300/2104 ... MIBA
F05D 2300/2106 ... Quartz
F05D 2300/2108 ... Phosphor
F05D 2300/211 ... Silica
F05D 2300/2112 ... Aluminium oxides
F05D 2300/2114 ... Sapphire
F05D 2300/2116 ... Zinc oxide
F05D 2300/2118 ... Zirconium oxides
F05D 2300/212 ... Aluminium titanate
F05D 2300/22 .. Non-oxide ceramics
F05D 2300/222 ... Silicon
F05D 2300/224 ... Carbon, e.g. graphite
F05D 2300/226 ... Carbides
F05D 2300/2261 .... of silicon

F05D 2300/2262 .... of titanium, e.g. TiC
F05D 2300/2263 .... of tungsten, e.g. WC
F05D 2300/228 ... Nitrides
F05D 2300/2281 .... of aluminium
F05D 2300/2282 .... of boron
F05D 2300/2283 .... of silicon
F05D 2300/2284 .... of titanium
F05D 2300/2285 .... of zirconium
F05D 2300/229 ... Sulfides
F05D 2300/2291 .... of molybdenum

F05D 2300/30 . Inorganic materials other than provided for in groups **F05D 300/10** to **F05D 300/2291**

F05D 2300/40 . Organic materials
F05D 2300/41 .. Leather
F05D 2300/42 .. Cellulosic materials, e.g. wood
F05D 2300/43 .. Synthetic polymers, e.g. plastics; Rubber
F05D 2300/431 ... Rubber
F05D 2300/432 ... PTFE (PolyTetraFluorEthylene)
F05D 2300/433 ... Polyamides, e.g. NYLON
F05D 2300/434 ... Polyimides, e.g. AURUM
F05D 2300/436 ... Polyetherketones, e.g. PEEK
F05D 2300/437 ... Silicon polymers
F05D 2300/44 .. Resins
F05D 2300/48 .. other organic materials

F05D 2300/50 . Intrinsic material properties or characteristics
F05D 2300/501 .. Elasticity
F05D 2300/502 .. Thermal properties
F05D 2300/5021 ... Expansivity
F05D 2300/50211 .... similar
F05D 2300/50212 .... dissimilar
F05D 2300/5023 ... Thermal capacity
F05D 2300/5024 ... Heat conductivity
F05D 2300/504 .. Reflective properties
F05D 2300/505 .. Shape memory behaviour
F05D 2300/506 .. Hardness
F05D 2300/507 .. Magnetic properties
F05D 2300/509 .. Self lubricating materials; Solid lubricants
F05D 2300/51 .. Hydrophilic, i.e. being or having wettable properties
F05D 2300/512 .. Hydrophobic, i.e. being or having non-wettable properties
F05D 2300/514 .. Porosity
F05D 2300/516 .. Surface roughness

F05D 2300/518 . . Ductility
F05D 2300/52 . . Translucence
F05D 2300/522 . . Density

F05D 2300/60 . Properties or characteristics given to material by treatment or manufacturing
F05D 2300/601 . . Fabrics
F05D 2300/6012 . . . Woven fabrics
F05D 2300/603 . . Composites; e.g. fibre-reinforced
F05D 2300/6031 . . . Functionally graded composites
F05D 2300/6032 . . . Metal matrix composites (MMC)
F05D 2300/6033 . . . Ceramic matrix composites (CMC)
F05D 2300/6034 . . . Orientation of fibres, weaving, ply angle
F05D 2300/604 . . Amorphous
F05D 2300/605 . . Crystalline
F05D 2300/606 . . Directionally-solidified crystalline structures
F05D 2300/607 . . Monocrystallinity
F05D 2300/608 . . Microstructure
F05D 2300/609 . . Grain size
F05D 2300/61 . . Syntactic materials, i.e. hollow spheres embedded in a matrix
F05D 2300/611 . . Coating
F05D 2300/6111 . . functionally graded coating
F05D 2300/612 . . Foam
F05D 2300/613 . . Felt
F05D 2300/614 . . Fibres or filaments
F05D 2300/615 . . Filler

F05D 2300/70 . Treatment or modification of materials
F05D 2300/701 . . Heat treatment
F05D 2300/702 . . Reinforcement